CH2MHILL Hanford Group, Inc.

Release date: 10/17/01
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Experts Team Up On Hanford Tank Leak Detection

RICHLAND, Wash.- Officials at the Hanford Site are conducting technology demonstrations to narrow the field of new methods for quickly detecting leaks from its radioactive waste tanks, a capability seen as important to the safe removal of millions of gallons of waste for eventual treatment in a glassification facility.

Led by the Department of Energy's Office of River Protection and tank farms contractor CH2M HILL Hanford Group, a team of experts from Pacific Northwest National Laboratory, other Department of Energy (DOE) sites and national laboratories, universities, and private industry are conducting the demonstrations on the Hanford Site.

"The ability to detect and assess a potential leak more quickly will help reduce the risk to public health and the environment during our efforts to retrieve millions of gallons of waste from Hanford's older single-shell tanks," said Bob Lober, DOE Office of River Protection Retrieval Team.

"Our retrieval strategy is to demonstrate state-of-the-art, low-volume retrieval technologies, coupled with leak-detection technologies, to safely move waste out of our high-risk single-shell tanks, per our commitments in the Tri-Party Agreement," said Joe Cruz, DOE Office of River Protection Retrieval Team.

In the past, 67 of the 149 single-shell tanks have leaked or are assumed to have leaked approximately one million gallons of highly radioactive and hazardous waste into the soil. To reduce the risk of future leaks, the liquid portion of waste in the older tanks is being pumped into newer, safer double-shell tanks. Now, the DOE Office of River Protection and tank farms contractor CH2M HILL Hanford Group are preparing to retrieve the remaining solid waste so it can be turned into glass in a planned treatment facility on the Hanford Site.

Retrieval efforts will involve the limited use of liquids to dissolve and transport waste from the tanks so it can be sent through pipes to double-shell tanks. To reduce the amount that a tank could leak during retrieval, a method of detecting leaks around and below the entire 75-foot width of a tank, in addition to existing or planned in-tank detection methods, is needed.

In the past, methods for detecting leaks outside the tanks have consisted primarily of lowering equipment into boreholes in the soil around the tanks. Radiation surveys can detect gamma-emitting radioactive contaminants in the soil, and neutron probes can detect moisture. The drawback of these methods is contamination in the soil has to be within a few feet of the boreholes for reliable detection.

In January, experts from across the country met at Hanford to narrow a new field of 20 possible leak-detection methods to six leading-edge technologies with the greatest likelihood of success under Hanford Site conditions.

"We are reaching out to the best and the brightest people in this field to help us improve our ability to detect leaks around tanks," said Rick Raymond, vice president of projects for CH2M HILL Hanford Group. "We're moving forward to reduce the risk by retrieving the remaining waste in Hanford's older tanks, and better methods of leak detection are important to our progress." Pacific Northwest National Laboratory led the demonstration of the six technologies around a mock tank in the 200 East Area this summer. The mock tank is two-thirds the width of the typical Hanford single-shell tank. It is open at the top, with half its 20-foot height buried 8-10 feet in the ground.

The mock tank setup included a 5000-gallon storage tank and a system of PVC (polyvinyl chloride) pipes to distribute a simulated tank leak liquid at various locations along the bottom or sides of the tank. The liquid was an environmentally friendly, non-radioactive saline solution, similar in density, viscosity, ionic strength, and electrical conductivity to tank waste. The liquid has been safely used as a simulated tank waste solution in other Hanford vadose zone plume-tracking activities.

The goal of the demonstrations was to identify more sensitive, reliable, and cost-effective leak-detection methods. The new technologies will enable operators to quickly determine the size and location of leaks. That is a major advantage over existing point-source measurement techniques that provide several smaller "snapshots" at a single point and require a leak to move closer to a borehole before it is detected.

Reports evaluating the six leak detection methods will be issued in the coming weeks.

Note: Video and photos of the tank-leak demonstrations are available upon request.

Leak-detection methods demonstrated

Six methods for detecting leaks in the soil around Hanford tanks were demonstrated at a mock tank on the Hanford Site. Several PVC and steel-cased boreholes were installed around the mock tank and leak-detection equipment was deployed, including lowering equipment into the boreholes. The six leak-detection methods are of four basic types:

Electrical Methods (3)

Three electrical methods were demonstrated. Two methods charge the ground with electricity and use detectors to sense how the current moves through the soil. Current passes through moisture more quickly. A third method operates much like a metal detector, using a coil of wire to create a magnetic field that interacts with the leak.

Tracer Gas Method

Also called Partitioning Interwell Tracer Tests, this method involves pumping air into a borehole and through the soil under the tank. Gas tracers that dissolve in waste are injected into the air stream, extracted at a borehole on the other side of the tank, and analyzed using gas chromatography. This method is a proven technology and has been used in the environmental remediation industry to detect and measure soil contamination.

Borehole Seismic Method

To make an image of a leak, this method uses sound reflecting off the target-in this case the high-density, simulated tank waste. The method also provides information on site geology, including soil types and soil-layering features.

Radar Method

This leak-detection method is similar to the borehole seismic method, except that radio waves are used to produce an image of the leak.

Pacific Northwest National Laboratory led the demonstrations, with support from the University of Texas at Austin, Duke Engineering Services, Lawrence Livermore National Laboratory, Lawrence Berkley National Laboratory, and HydroGEOPHYSICS, Inc.

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Last Updated: 10/17/2001 09:51:55